REMARKS/ARGUMENTS

Claims 1-20 are pending in the present application. Claims 5 and 17 were canceled; claims 1, 9, and 13 were amended; and claims 21-22 were added. Support for the claim amendments and the new claims can be found at least on Specification, p. 14, ll. 8-19; Specification, p. 18, ll. 6-25; canceled original claims 5 and 17; and Figure 5. Reconsideration of the claims is respectfully requested.

I. Examiner Interview Summary

Applicants thank Examiner Ernest Unelus for the courtesies extended to Applicants' representatives during the July 19, 2006 telephone interview. During the interview, Applicants' representatives discussed the distinction between the claims and the *Tojima* reference, and possible claim amendments. The Examiner agreed that the distinctions drawn by Applicants were good, and that the amendments would move the prosecution forward. No agreement was reached as to the amendment of the claims, or allowability of the claims.

Applicants also discussed the non-statutory subject matter rejection of claim 13 under 35 U.S.C. § 101. The Examiner stated that the argument made by Applicants based on the USPTO's interim guideline of October, 2005 were good. The Examiner stated that in case of this rejection requiring further action, a subsequent office action on this rejection would not be final.

II. 35 U.S.C. § 101

The Examiner has rejected claims 13-20 under 35 U.S.C. § 101 as being directed towards non-statutory subject matter. This rejection is respectfully traversed.

The Examiner has rejected this claim stating:

> Claims 13-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. In page 32 in the applicant's specification, subject matter such as radio frequency and light wave transmissions are non-statutory embodiments.

Office action dated May 22, 2006, p. 3.

However, the rejection is incorrect in view of new guidelines covering patentability of claims directed to a process in a computer readable medium. The USPTO guidelines for evaluating computer-readable medium encoded with functional descriptive material, such as a computer program, expressly states that a claim to such computer-readable medium, when so encoded, is statutory subject matter. USPTO, *Interim Guideline for Examination of Patent Application for Patent Subject Matter Eligibility* (26 Oct. 2005) (hereinafter "The Guideline"). The Guideline provides, in relevant part:

> "[A] claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory."

Id., p. 52.

The Guideline further provides:

> Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. O'Reilly, 56 U.S. (15 How.) at 112-14. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in § 101.
>
> ...
>
> These interim guidelines propose that such signal claims are ineligible for patent protection because they do not fall within any of the four statutory classes of § 101. Public comment is sought for further evaluation of this question.

Id., pp. 55-56.

The arguments advanced below using independent claim 13 are similarly applicable to claims 14-20, which depend from the independent claim 13. Claim 13 in the currently amended form recites:

> A computer program product in a computer readable medium for managing direct memory access resources, the computer program product comprising:
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> first instructions, responsive to a change in context for a direct memory access resource, for storing data relating to a context switch in a context switch history containing a number of prior context switches occurring prior to a current context, wherein the context switch history is a circular context switch history table used for freeing portions of memory used for direct memory access chain of requests; and
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> second instructions for freeing portions of the direct memory access chain of requests using the context switch history to form freed portions, wherein the freed portions are reused for requests.

Claim 13 is directed to a computer program product in a computer readable medium. Furthermore, the computer program product is for use in a data processing system. As The Guideline provides, "a computer readable medium with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized" is statutory. Because claim 13 recites a computer program product for use in a data processing system, along with the other recited steps, claim 13 does describe a data structure that defines structural and functional interrelationships between the data structure and the computer software and hardware components, which permit the data structure's functionality to be realized. Thus, claim 13 is patentable subject mater under 35 U.S.C. § 101, as explained under The Guideline.

In addition, the instant claim does not recite a signal. Rather, the claim recites a "computer readable medium" in which a signal is embedded. Claim 13 claims functional descriptive material encoded on a computer readable medium and does not claim signals encoded with functional descriptive material. For this reason, claim 13 falls under allowable statutory matter under 35 U.S.C. § 101. This assertion is fully supported by the specification that provides:

> "Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as digital and analog communication links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions."

Specification, p. 33. (Emphasis added)

The specification and claim 13 are statutory subject matter because the claim is directed towards the medium, and not to the radio frequency or the light wave signals that may inherently be used in such media technologies. The use of radio frequency or light wave as a method of encoding or recording the computer program on to such medium does not render the medium itself nonstatutory. Even in case of a CD-ROM, a laser form of light wave is used for accomplishing the encoding/recording of the information on to the CD-ROM, yet the CD-ROM remains a well-accepted computer readable medium. Encoding the air or glass fiber medium with radio frequency or light wave similarly cannot render the air or glass fiber medium nonstatutory under § 101.

Thus, based on the MPEP and applicable case law, claim 13 is statutory under 35 U.S.C. § 101. Accordingly, Applicants respectfully request withdrawal of the rejection of claim 13 under 35 U.S.C. § 101. By virtue of their dependence from claim 13, the rejection of claims 14-20 should also be withdrawn.

III. 35 U.S.C. § 112, Second Paragraph

The Examiner has rejected claims 1, 9, and 13 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter, which applicants regard as the invention.

Applicants have amended claims 1, 9, and 13 accordingly. Therefore the rejection of claims 1, 9, and 13 under 35 U.S.C. § 112, second paragraph has been overcome.

IV. 35 U.S.C. § 102, Anticipation

The Examiner has rejected claims 1-20 under 35 U.S.C. § 102(b) as being anticipated by *Tojima* et al., High-performance DMA controller, United States Patent Application Publication No. US

2002/0026543 A1 (published, February 28, 2002) (hereinafter, "*Tojima*"). This rejection is respectfully traversed.

The Examiner has rejected these claims stating:

> Claims 1-20 are rejected under 35 U.S.C. 102(b) as being anticipated by *Tojima* et al. (US pub. 2002/0026543).
>
> As per claims 1 and 9, *Tojima* discloses "a method for managing direct memory access resources (see fig. 1), the method comprising: responsive to a change in context for a direct memory access resource (paragraph 0095 discloses "The priority level decoder 201 decodes the priority level of an inputted DMA transfer request to determine a register where the request is to be stored", as the decoder decode, it's determining the priority level of a request, which is a form of responding to changes in the context), storing data relating to the switch in a context switch history (parameter memory 105 in fig. 1) containing a number of prior context switches occurring prior to a current context (paragraph 0099 discloses "Initially, the processor 111 stores parameters required for execution of DMA transfer in the DMA parameter memory 105 through the local bus. The parameters are as follows: read/write information, access unit information such as byte or word, access information indicating consecutive access, rectangle access, ring pointer access, or the like, various kinds of address information such as start address, and the number of transfers". As the paragraph discloses, these parameters about previous context switches are stored prior to a current context. Also disclose, in paragraph 0246, "As described above, according to the eighth embodiment of the invention, since the number of repetition is designated, the processor (DMA transfer request source) does not need to make plural requests of the same DMA transfer, whereby the request issuing process is simplified. This facilitates the hardware design of the processor, and the software design such as programming of the processor. As the result, the load on development is reduced, and the easiness of development is increased"; and freeing portions of the direct memory access chain of requests using the context switch history to form freed portions (paragraph 0097 discloses "The selector 202 selects the resource type information outputted from the priority-level reservation registers 211-213", as the selector selects a request out of any resources (portions), that resource (portion) becomes free once the request that is inside of it leaves), wherein the freed portions are reused for requests (once a request leaves, that space becomes available for a new request to come into it).

Office action dated May 22, 2006, pp. 3-5.

A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). All limitations of the claimed invention must be considered when determining patentability. *In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034 (Fed. Cir. 1994). Anticipation focuses on whether a claim reads on the product or process a prior art reference discloses, not on what the reference broadly teaches. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983). In this case, each and every feature of the

presently claimed invention is not identically shown in the cited reference, arranged as they are in the claims.

Tojima does not anticipate claims 1-20 as asserted by the Examiner. Applicants distinguish the reference from the claims using claim 1 as an example. The arguments below applied to claim 1 are similarly applicable to the claims 2-10, 13-21, and 24. Claim 1 recites:

> A method for managing direct memory access resources, the method comprising:
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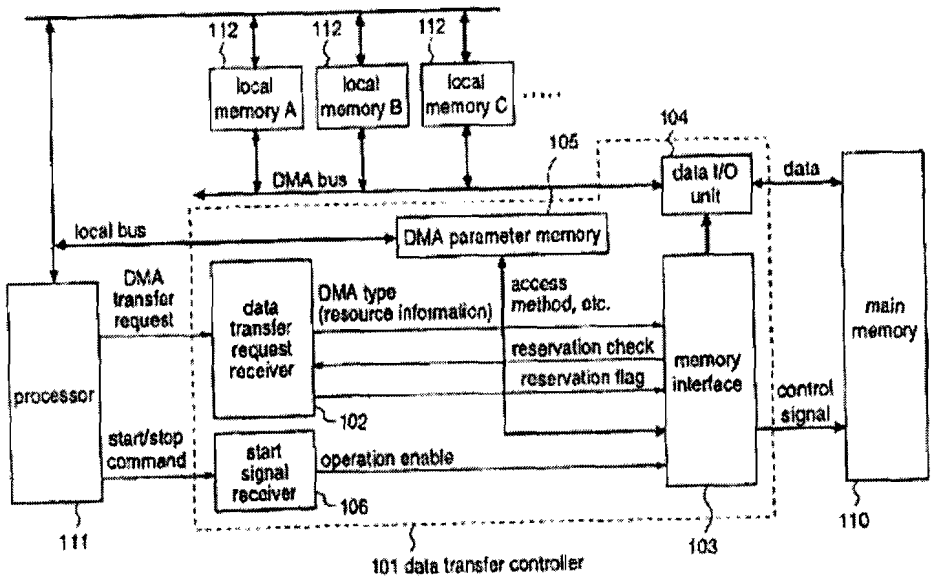
> responsive to a change in context for a direct memory access resource, storing data relating to a context switch in a context switch history containing a number of prior context switches occurring prior to a current context, wherein the context switch history is a circular context switch history table used for freeing portions of memory used for direct memory access chain of requests; and
>
> freeing portions of the direct memory access chain of requests using the context switch history to form freed portions, wherein the freed portions are reused for requests.

In the overall combination of claim 1, *Tojima* does not teach or suggest "storing data related to a context switch in a context switch history," "[the context switch history] containing a number of prior context switches occurring prior to a current context," and "freeing portions of the direct memory access chain of requests using the context switch history" features of claim 1.

The Examiner cites the following section of *Tojima* as teaching the "storing data related to a context switch in a context switch history" and "[the context switch history] containing a number of prior context switches occurring prior to a current context" features:

Fig.1



Tojima, figure 1.

> Initially, the processor 111 stores parameters required for execution of DMA transfer in the DMA parameter memory 105 through the local bus. The parameters are as follows: read/write information, access unit information such as byte or word, access information indicating consecutive access, rectangle access, ring pointer access, or the like, various kinds of address information such as start address, and the number of transfers.

Tojima, para. 0099.

In the cited section, *Tojima* teaches a DMA parameter memory referenced by reference numeral 105 in *Tojima's* figure 1. Elsewhere in *Tojima's* disclosure, *Tojima* provides that:

> The memory interface 103 generates a control signal to the main memory 110, the data I/O unit 104 controls input and output of data, and the DMA parameter memory 105 holds parameters required to execute DMA transfer.

Tojima, para 0091.

From the above description, and the Examiner-cited section, *Tojima* makes clear that the purpose of the DMA parameter memory is to hold parameters that the DMA controller requires for executing the direct memory access transfer as requested. *Tojima* provides that such parameters are – the read/write information to be transferred, data length specification to perform that transfer, the type of access to use to perform that transfer, addresses to use for the transfer, and the number of transfers to perform. By

Tojima's own definition, the DMA parameter memory stores what is "required for execution of DMA transfer."

The Examiner incorrectly believes that *Tojima's* DMA parameter memory is the same as the context switch history as recited in claim 1. Applicants have amended claim 1 to clarify that, "the context switch history is a circular context switch history table used for freeing portions of memory used for direct memory access chain of requests." These amendments are fully supported by the original specification as follows:

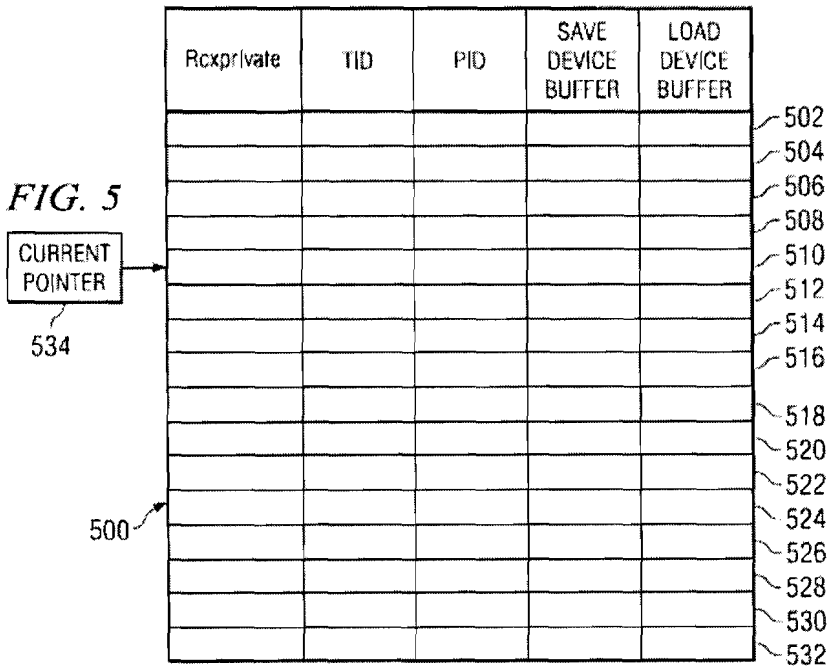
> Additionally, history table **326** may be accessed by DMA resource control extension **324**. In these examples, history table **326** contains data relating to prior context switches for DMA resource **316**. This table keeps track of a number of prior context switches, such as the last 16 context switches. In the illustrative examples, the data relating to the context switches is stored in a circular list in the table. The information in history table **326** may be used for freeing memory, such as those used for DMA request chains. These chains also are referred to as "user queues". Also, the table may be used for debugging purposes.

Specification, p. 14, ll. 8-19.

> Each entry in context switch history table **500** contains data about a context switch for the DMA chain or user queue. In these illustrative embodiments, each entry includes the following fields: Rcxprivate, thread ID (TID), process ID (PID), save device buffer, and load device buffer.

Specification, p. 18, ll. 10-15.

FIG. 5



Specification, figure 5.

Context switch history is a circular history table data structure, which may reside in the DMA controller's memory, as distinct from *Tojima's* DMA parameter memory, which is the physical memory itself. Particularly, *Tojima's* parameter memory is not a table structure, nor does *Tojima* teach or disclose the presence of any table in *Tojima's* parameter memory. Even if, *arguendo*, *Tojima's* DMA parameters and the claimed context switch history table datastructure are deemed to be located on the same physical memory, the two are vastly different from one another. *Tojima* does not teach or suggest that the DMA parameters are in a circular table form as recited in claim 1. *Tojima* also does not teach or suggest that the DMA parameters are used for freeing up memory used for DMA request chains as recited in claim 1. At least for these two reasons, *Tojima* does not teach or suggest these recited features of claim 1. Therefore, the Examiner's assertion that the DMA parameter memory in *Tojima* anticipates context switch history in claim 1 is not supported by *Tojima*.

Furthermore, because *Tojima's* DMA parameter memory is not the same as the recited context switch history, *Tojima's* DMA parameter memory also does not support, "containing a number of prior context switches occurring prior to the current context" feature of claim 1. The Examiner states,

> "As the paragraph [0099 in *Tojima*] discloses, these parameters about previous context switches are stored..."

Office action dated May 22, 2006, p. 4.

Applicants respectfully disagree that *Tojima* discloses anything about storing information about previous context switches in the paragraph cited by the Examiner. In fact, *Tojima* contains no disclosure whatsoever about information relating to context switches, or saving such information. Additionally, *Tojima* is further lacking in any disclosure that can be interpreted as teaching storing such information in the DMA parameter memory as asserted by the Examiner.

Similarly, the Examiner's analysis of *Tojima's* disclosure for the anticipation rejection of the claim 1 feature "freeing portions of the direct memory access chain of requests using the context switch history" is also flawed. The Examiner-cited paragraph from *Tojima* provides:

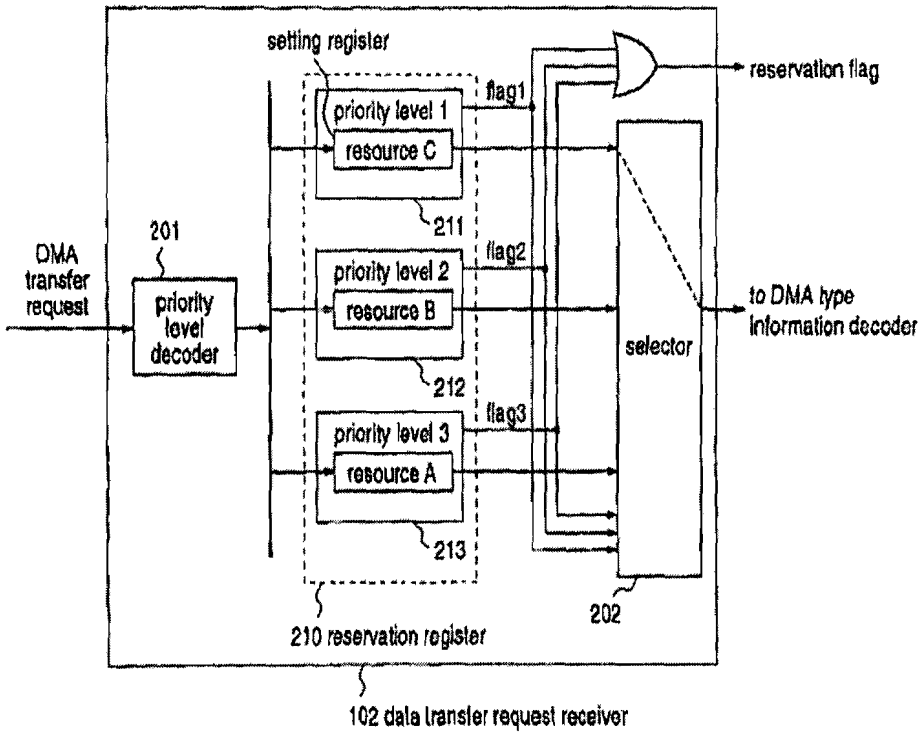
> The selector 202 selects the resource type information outputted from the priority-level reservation registers 211~213, and the selection depends on the states of the reservation flags 1~3 outputted from the respective priority-level reservation registers.

Tojima, para 0097.

This paragraph in *Tojima* describes a different region of the DMA controller, namely, the data transfer request receiver, identified by reference numeral 102 in *Tojima's* figure 1 reproduced above.

Furthermore, the Examiner's citation from this paragraph pertains to the selection of resource-type information based on the state of certain registers. *Tojima's* figure 2, to which the above-cited paragraph refers to is as follows:

Fig.2



Tojima figure 2.

Several distinctions exists between the teachings and suggestions of this Examiner-cited paragraph and the claimed feature. First, the claim feature "freeing portions of the direct memory access chain of requests using the context switch history" continues to recite the use of the context switch history. The Examiner, by citing to this paragraph, now uses the data transfer request receiver as the equivalent of the context switch history, and not the DMA parameter memory as the Examiner previously argued.

Whether treated separately or in combination with *Tojima's* DMA parameter memory, the data transfer request receiver does not equate to the context switch history as claimed. The data transfer request receiver is also devoid of any data structure that resembles the context switch history table. The contents of the data transfer request receiver are register data corresponding to priority levels of the

various DMA transfer requests. These contents do not resemble the contents of the context switch history because the register contents in data transfer request receiver registers pertain to currently pending DMA requests, whereas the contents of the context switch history data structure are historical – "containing a number of prior context switches" – as recited in claim 1.

Furthermore, the Examiner-cited paragraph describes the selection process among the various prioritized register contents. Even if none of the above-described distinctions is considered for a moment, this selection process does not anticipate "freeing portions of direct memory access chain of requests using the context switch history." The Examiner states, "as the selector selects a request out of any resource (portions), that resource (portion) becomes free once the request that is inside of it leaves." Naturally, any data residing in any volatile memory leaves at some point in time. So, registers in the data transfer request receiver will also eventually be freed up through some process. However, the reference does not teach that the selection process that the Examiner relies upon causes the request contained within the selected register to leave, freeing up the register.

In addition, in rejecting claims 5 and 17, which have been incorporated into claims 1 and 13 respectively and now stand canceled, the Examiner states:

> As per claims 5 and 17, *Tojima* discloses, "wherein the context switch history is a circular list of a number of context switches" (according to paragraph 0053 of the applicant's specification, which discloses that circular is to list the request in a chain, such as a "chain of requests", similar, *Tojima* discloses, in fig. 2, a chain of requests. This chain is made up resources C, B, and A. Requests will be process from priority level 1 to priority level 3 and back around again to level 1.

Office action dated May 22, 2006, p. 6.

Contrary to the Examiner's interpretation, the list of registers in *Tojima's* figure 2, reproduced above, is a linear sequence of registers, not circular as the Examiner argues and claim 1 recites. Even if, *arguendo*, the processing of these registers in *Tojima* occurs as the Examiner posits, only the processing of the registers may be deemed circular, the list of registers remains unchanged and linear. Otherwise, every list that is scanned top to bottom in a repeated fashion will automatically transform into a circular list. A person of ordinary skill in the art recognizes that a circular list is a data structure with a specific implementation, for example in a doubly linked list, setting the forward pointer of the last linked element to the first linked element, and setting the back pointer of the first linked element to the last linked element. Simply scanning a doubly linked list without the forward and back pointers set in this way, will not transform a linear doubly linked list into a circular doubly linked list.

For these reasons, *Tojima* also does not anticipate "freeing portions of direct memory access chain of requests using the context switch history" feature of claim 1. "storing data related to a context switch in a context switch history," "[the context switch history] containing a number of prior context

switches occurring prior to a current context," and "freeing portions of the direct memory access chain of requests using the context switch history" features of claim 1. Consequently, *Tojima* does not anticipate claim 1 under 35 U.S.C. § 102(b). Independent claims 9 and 13 contain features similar to those in claim 1, and are also not anticipated by *Tojima* for the same reasons.

Claims 2-8, 10-12, and 14-20 are also not anticipated by *Tojima* at least by virtue of their dependence from independent claims 1, 9, and 13 respectively. Consequently, Applicants respectfully urge that the rejection of claims 1-20 under 35 U.S.C. § 102(b) has been overcome.

V. Conclusion

It is respectfully urged that the subject application is patentable over *Tojima* and is now in condition for allowance.

The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

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Respectfully submitted,

/Rakesh Garg/

Rakesh Garg
Reg. No. 57,434
Yee & Associates, P.C.
P.O. Box 802333
Dallas, TX 75380
(972) 385-8777
Agent for Applicants